**Assessing Children's Exposures to Pesticides: An Important Application of the Stochastic Human Exposure and Dose Simulation Model (SHEDS)**

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Accurately quantifying human exposures and doses of various populations to environmental pollutants is critical for the Agency to assess and manage human health risks. For example, the Food Quality Protection Act of 1996 (FQPA) requires EPA to consider aggregate human exposure to a pesticide, especially for infants and children, when making regulatory decisions on that pesticide's usage. Pesticides and metals are two examples of pollutants that can be present in multiple environmental media (air, water, soil, house dust, food, surface residues) and that can contact a human via various routes and pathways. These include dietary ingestion, inhalation, dermal contact, and non-dietary ingestion from hand-to-mouth or object-to-mouth activities.

The FQPA was the impetus for the development of computer models that simulate children's pesticide exposures and doses for various exposure scenarios. Since 1998 the EPA's Office of Research and Development (ORD), National Exposure Research Laboratory (NERL) has been developing a physically-based probabilistic model called the Stochastic Human Exposure and Dose Simulation Model (SHEDS) for pesticides. SHEDS can answer questions such as:

- What are the population distribution exposure and dose, accounting for variability in activity patterns, environmental concentrations contacted, and other factors?
- What is the uncertainty the model estimates?
- What is the time profile of exposures for individuals in a population?
- Which sources, media, pathways, and factors contribute the most?
- Which additional measurements should be collected to minimize uncertainty?
- How can we most effectively reduce exposure?
- Do modeled estimates compare well against field measurements?

This work involves collaborations between ORD and EPA's Office of Pesticide Programs (OPP), with ORD/NERL's University Partners for modeling, and within ORD. The SHEDS research for CCA is being used as part of OPP's public health risk assessment. We are applying SHEDS to three case studies for children: (1) aggregate chlorpyrifos exposures from indoor crack and crevice applications, lawn treatments, and garden treatments [planned for Fiscal Year 2004 timeframe to demonstrate the model framework and evaluation of SHEDS against real-world measurements]; (2) arsenic and chromium exposures from chromated copper arsenate (CCA)-treated wood on decks and playsets [this application is currently being done for OPP's Antimicrobials Division's health risk assessment which is scheduled for presentation to OPP's Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) Science Advisory Panel (SAP) in December 2003]; and (3) pyrethroid pesticide exposures from indoor crack and crevice, broadcast, and fogger treatments; lawn and garden treatments; and contact with treated pets [planned for the Fiscal Year 2003/2004 time frame to help OPP in their FQPA decision for pyrethroids]. To conduct these case studies, a user-friendly model with a graphical user interface has been developed and is constantly being updated for exposure researchers and environmental regulators.

The SHEDS chlorpyrifos research demonstrates the model framework and evaluation of the model against real-world measurements. The SHEDS pyrethroids research is intended to help OPP in their FQPA decision for pyrethroids.

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